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Revision 2

**FIVE-YEAR REVIEW
FINAL REPORT**

**LEES LANE LANDFILL SITE
LOUISVILLE, JEFFERSON COUNTY, KENTUCKY**

Work Assignment No. 83-4FE43

June 1998

REGION 4

U.S. EPA CONTRACT NO. 68-W9-0057

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DECLARATION FOR THE LEES LANE LANDFILL FIVE-YEAR REVIEW

SITE NAME AND LOCATION

Lees Lane Landfill
Louisville, Kentucky

STATEMENT OF BASIS AND PURPOSE

This document presents the current conditions at the Site and makes recommendations regarding Operation and Maintenance activities and future reviews. Section 121(c) of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), as amended, requires that if a remedial action is taken that results in any hazardous substances, pollutants, or contaminants remaining at a site, the Environmental Protection Agency (EPA) shall review such remedial action no less than each five years after initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented.

ASSESSMENT OF THE SITE

The Site was delisted from the National Priorities List in June 1996. The response actions conducted at the Site continue to be protective of human health and the environment. However, the gas collection system requires corrective measures in order to ensure that the site will not present a human health risk in the future. This document has been reviewed by EPA Region 4, and the Commonwealth of Kentucky. EPA will ensure that this Site remains protective by conducting five-year reviews in the future. The next review should be completed by June 2003.

Approved by: _____



Richard D. Green, Director
Waste Management Division

Date: _____

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SECTION 1

INTRODUCTION

The Lees Lane Landfill site (the Site) was added to the National Priorities List in December 1982. Following a Remedial Investigation/Feasibility Study by the U.S. Environmental Protection Agency (EPA) and NUS Corporation, an Enforcement Decision Document (EDD) was issued by the EPA in September 1986. The EDD established four response objectives. The EPA commenced response actions in March 1987, and concluded in December 1987. A description of the response actions is presented in Section 1.4 of this report. Subsequent to completion of response actions, the EPA performed operational and maintenance (O&M) activities for one year. On July 16, 1991, the EPA entered into an Administrative Order on Consent with the Louisville and Jefferson County Metropolitan Sewer District (MSD). Under this order, the MSD agreed to perform certain O&M activities at the site for 29 years. The Commonwealth of Kentucky entered into an Intergovernmental Response Agreement with the EPA on April 7, 1994. Under this agreement, Kentucky is providing oversight of MSD's O&M activities. The site was officially delisted from the NPL in May 1996.

Consistent with Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA) as amended by Superfund Amendments Reauthorization Act of 1986 (SARA), Section 121(c) and Section 300 430(f)(ii) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), a statutory five-year review to evaluate the effectiveness of the response actions was performed at this site. EPA Region 4 has determined that a Level I analysis is appropriate for the Lees Lane Landfill site.

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The review was intended to confirm that the response actions and on-going O&M activities remain protective of human health and the environment.

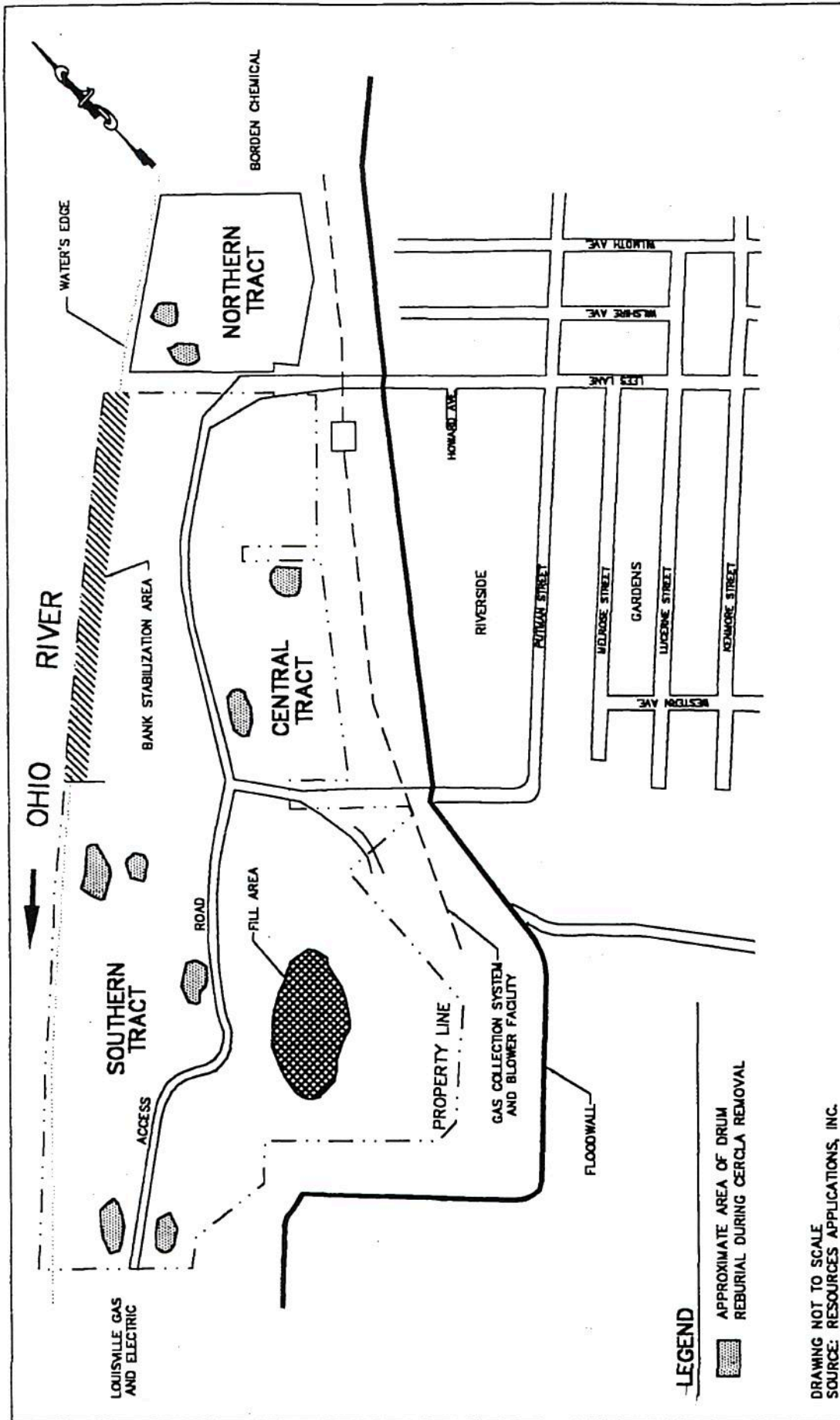
In March 1993, Resource Applications, Inc. (RAI) submitted a Five-Year Review Report of the response actions at the Lees Lane Landfill site. RAI's report was provided to WESTON by the EPA's Remedial Project Manager, as the source of background information conducting a second five-year review. Pertinent information from RAI's report is excerpted in this report.

1.1 SITE LOCATION AND DESCRIPTION

The Lees Lane Landfill site is located approximately 4.5 miles south of Louisville, Kentucky in Jefferson County. The 112-acre site was originally used as a sand and gravel pit and as a junkyard. Filling operations reportedly began in the late 1940s and municipal and industrial wastes were accepted until late 1974. The Site is divided into three tracts: northern, central and southern (Figure 1-1).

Most of the Site is level to gently sloping, with one depression having steep slopes on the southern end of the Site. The surface is primarily covered with well established vegetation ranging from brush to woodlands. The Site lies within the 100-year floodplain of the Ohio River.

The Site is adjacent to various chemical plants, such as Borden, Inc., and to the south is the Louisville Gas and Electric Cane Run Plant. Across the floodwall to the east is Riverside Gardens, a residential development of about 330 homes and 1,100 people. The west side of the Site has a terraced area functioning as a buffer zone between the landfill and the Ohio River.



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According to RAI's report, the geology of the Site area consists of approximately 110 feet of Ohio River alluvium and glacial out-wash underlain by the New Albany shale, reported to be 100 feet thick. The alluvial aquifer is unconfined with the shale forming an aquitard between the alluvial aquifer and the deeper limestone aquifers. Both the alluvial and limestone aquifers are current and potential sources of drinking water.

The water table is reported to begin approximately 50 feet below land surface and the saturated thickness of the alluvial aquifer is approximately 60 feet. The groundwater flow direction is predominantly toward the Ohio River with a potential for groundwater flow under the river. During periods of high flow in the river, groundwater and, therefore, contaminant-migration may reverse. It has been estimated that in order for flow reversal to reach Riverside Gardens, the high water conditions would need to be sustained for up to 120 days.

1.2 SITE HISTORY

Land use at the Lees Lane Landfill site has included a sand and gravel quarry, a junkyard, and a landfill. The period of sand and gravel operations at the Site began as early as the 1940s while the landfill operations were reported to have begun in the late 1940s. Over a 27-year period, the site received domestic, commercial, solid municipal, and industrial wastes. Estimates indicate at least 212,400 tons of mixed industrial wastes and drummed materials were disposed of at the site by Louisville area industries.

RAI's report states that fill areas are located in the central and southern tracts and excavation areas in the northern and southern tracts (Figure 1-1). Information for the Lees Lane Landfill indicates that the northern tract fill area was eventually filled with wastes; however, the Site was closed before the fill area in the southern tract was completely filled.

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The southern tract of the Site operated under a permit issued by the Commonwealth under its Solid Waste Program. The permit was issued in 1971 and expired in November 1974. This permit was not renewed and, in April 1975, the landfill was closed.

Early in 1975, Riverside Gardens residents reported "flash fires" around their water heaters. Investigations indicated explosive levels of methane gas and seven families were evacuated from their homes near the site. The vacated homes were (eventually) purchased by Jefferson County Housing Authority and in 1978, extensive monitoring was conducted to define the gas migration problem. A gas venting system was installed in October 1980, along the property boundary southeast of the site (between the site and Riverside Gardens).

An investigation by the Kentucky Department of Hazardous Materials and Waste Management (HMWM) in 1980 revealed about 400 drums on a terrace approximately 100 feet from the Ohio River bank. At least 50 chemicals were identified, including phenolic resins, benzene, and notable concentrations of copper, cadmium, nickel, lead, and chromium. In September and October of 1981, the drums were removed by the site owners under court order. The hazardous wastes were removed from the drums and transported to an approved hazardous waste disposal facility, while the remaining non-hazardous materials and the empty drums were buried on site.

The Kentucky Natural Resources and Environmental Protection Cabinet (KNREPC) installed shallow groundwater monitoring wells at the site in 1981. The results of analyses showed high concentrations of heavy metals and aluminum. The analytical report qualified these results by stating that many of the sample concentrations were likely to have been elevated due to excessive sediment in the samples caused by poor well construction.

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The Site was ranked on the National Priorities List in December 1982 and, in April of 1986, EPA (using NUS and the FIT contract) completed its Remedial Investigation/Feasibility Study (RI/FS). The RI report identified the following 4 contaminants of concern: arsenic, chromium, lead, and benzene. In September 1986, EPA issued an EDD to initiate containment activities.

EPA conducted response actions at the Site in accordance with the EDD between March 1987, and December 1987. The response actions are identified in Section 1.3, herein. Operational and Maintenance (O&M) activities, also presented in Section 1.3, were performed for one year by EPA following the completion of the response activities.

On July 16, 1991, the EPA entered into an Administrative Order on Consent with the Louisville and Jefferson County Metropolitan Sewer District (MSD), under which MSD agreed to perform certain O&M activities at the Site for twenty-nine (29) years. The Commonwealth of Kentucky entered into an Intergovernmental Response Agreement with EPA under which Kentucky provides oversight of MSD's O&M activities. This agreement was executed on April 7, 1994.

During the December 1991 site visit, some leaking drums were observed on site. These drums were subsequently removed by KNREPC.

The initial five-year review was performed by RAI in 1992 and 1993, and commenced with a site visit with EPA on January 30, 1992. Based on site observations and review of pertinent documents, RAI determined that EPA's response actions remained protective of human health and the environment, but was impaired. RAI stated that three of the four objectives of the EDD were successfully achieved as follows:

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- Objective 1: Monitoring contaminant levels in the groundwater. Contaminant levels in the groundwater were relatively low in both on-site and off-site wells.
- Objective 2: Reduction of inhalation of hazardous gases in the ambient air. The amounts of hazardous gases in the ambient air detected in quarterly sampling were very low.
- Objective 4: Prevention of exposure to the wastes by direct contact. Construction of clay capping reduced the direct contact exposure pathway to negligible levels.

Objective 3, prevention of off-site migration of hazardous gases through the subsurface soils, was the greatest concern identified by RAI's five-year review. At the time of RAI's January 1992, site visit, RAI found the gas collection system to be in poor condition, which could lead to off-site migration of gases in subsurface soils.

RAI recommended implementation of the following corrective actions in order to restore the site to an effective status:

1. Restore the existing gas collection system to optimum operating efficiency, including balancing the system and installing anti-theft/vandalism signs to mark the well heads.
2. Perform repairs in several places of the capped area, including stabilizing a weak zone that runs across the landfill and down the rip-rap bank.
3. Install anti-theft/vandalism warning signs.
4. Continue sampling groundwater, gas monitoring wells, and ambient air on an annual basis.
5. Perform routine maintenance to the site such as mowing the grass.
6. Restore the gas and groundwater monitoring wells, including fixing damaged well MW-04, repainting the protective casings on the wells, repairing cracked pads, and replacing broken guard rails.
7. Continue to perform a formal survey of the rip-rap bank to determine the occurrence of shifting or settling.

1.3 DESCRIPTION OF THE RESPONSE ACTIONS

In accordance with the EDD, the selected response action for the Lees Lane Landfill site included the following activities:

- Installation of security gates and cautionary signs;
- Capping "hot spots" with clay;
- Burial on site of empty drums and drums containing non-hazardous materials;
- Removal of drums containing hazardous wastes for off-site disposal;
- Construction of a rip-rap slope along the Ohio River bank in the central tract;
- Installation of survey monuments to detect slope movement along the rip-rap slope;
- Repair of an existing drainage ditch;
- Installation of a 20-inch drainage pipe as part of the drainage system;
- Installation of 10 gas monitoring wells;
- Installation of two additional groundwater monitor wells;
- Repair of the existing gas collection system;
- Installation of an alternate water supply for residents within 1,500 feet of the site, and
- Implementation of O&M activities for one year following completion of response activities. O&M activities included the following:
 - Inspection of gas monitoring wells;
 - Quarterly sampling and analysis of gas and groundwater;

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- Sampling and analysis of ambient air three times a year, and
- Inspection and maintenance of the gas collection system, capped waste areas, and the rip-rap along the Ohio River bank.

These response activities were implemented in order to fulfill the following four response objectives established in the EDD:

- Monitor contaminant levels in the groundwater;
- Reduce inhalation of hazardous gases in the ambient air;
- Prevent off-site migration of hazardous gases through subsurface soils, and
- Prevent exposure to the wastes by direct contact.

EPA performed response actions between March 1987 and December 1987.

1.4 ARARS REVIEW

Section 121 (d)(2)(A) of CERCLA incorporates into law the CERCLA Compliance Policy, which specifies that Superfund remedial actions must meet any Federal standard, requirements, criteria, or limitations that are determined to be legally applicable or relevant and appropriate requirements (ARARs). Also included is the provision that State ARARs must be met if they are more stringent than Federal requirements.

The following ARARs have been found to be applicable to this site:

- National Safe Drinking Water Act, Maximum Contaminant Levels
- Kentucky Administrative Regulations
- Clean Water Act
- RCRA 40 CFR Part 264, Groundwater Protection Standards
- CERCLA § 121(d)(2)(B)(ii), Development of Alternate Concentration Limits (ACLs)

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A review of these potential ARARs revealed that only those standards associated with groundwater, surface water, and gas migration are relevant to the current status of the site during operational maintenance.

In June 16, 1987, EPA's Ground-Water Technology Unit recommended ACLs for the Ohio River of the Lees Lane Landfill Site. These ACLs were designed to take into account the fact that the Site is adjacent to the Ohio River and that the shallow groundwater beneath the Site discharges directly into the river. The recommended ACLs were specifically created for contaminants of concern in monitoring wells MW-04 and MW-05.

As part of this five-year review, Weston re-evaluated the 1987 recommended ACLs. Weston contacted Mr. Robert Pugh of KNREPC to discuss the Kentucky regulatory standards that EPA uses to develop such ACLs. These regulatory standards are found in the Warm Water Habitat Protection Act (WAH) and the Domestic Water Supply Source Criteria (DWS). EPA also reviewed the Kentucky water-quality criteria and found that the domestic water supply criteria values now include a maximum criterion of 0.0068 ug/L. WESTON contacted the U.S. Army Corps of Engineers (USACE) Hydraulic Branch in Louisville, Kentucky to obtain current values of minimum flows in the Ohio River. This flow is used to determine the magnitude of dilution for calculating the ACL. USACE maintains the stage level in the river with a system of locks and dams. USACE stated that it tries to maintain a minimum daily flow of 6,000 cubic feet per second (cfs) downstream of the Louisville locks. USACE also provided an average flow 11,000 cfs which is a statistical 7 day, 10-year daily flow. On 2/13/98, WESTON contacted USACE (2/13/98), the daily flow was 330,000 cfs. As seen by these varying flow values in the Ohio River vary widely depending on the time of year.

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Based on the inclusion of beryllium on the DWS Criteria and the change in average flow in the Ohio River, the previously recommended ACLs should be modified. Table 1-1 lists the contaminants of concern and their respective modified recommended ACL. A dilution factor of 1,100 was used to set the ACLs utilizing a groundwater discharge rate of 10 cfs along the Ohio River side of the site and an average flow of 11,000 cfs.

Pertinent regulations from the State of Kentucky include those regulating the emission of explosive gases from landfills. The regulations require that the level of gases shall not exceed 25 percent of the lower explosive limit (LEL) in facility structures, or the LEL for all gases at the property boundaries.

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Table 1-1

**Recommended Alternate Concentration Limits as of February 1998
(Used for Monitoring Wells MW-04 and MW-05)
Lees Lane Landfill, Louisville, Kentucky**

Contaminant of Concern	Standard (mg/l)	Regulatory Basis *	ACL (mg/l)
Arsenic	0.05	WAH	55
Barium	1.00	DWS	1,100
Beryllium	0.0068 ug/L	DWS	7.48 ug/L
Cadmium	0.012	WAH	13.2
Chromium (hexavalent)	0.05	OMS	55
Copper (H = 140)	0.022	OMS	24.2
Iron	1.00	WAH	1,100
Lead (dissolved)	0.05	OMS	55
Manganese	0.05	DWS	55
Mercury	0.0002	WAH	0.22
Selenium	0.01	DWS	11
Zinc	0.07	WAH	77
Benzene	0.0012	DWS	1.32

Notes:

mg/l - Milligrams per liter

ug/L - Micrograms per liter

* From the Kentucky Division of Water Administrative Regulations:

WAH - Warm water Aquatic Habitat

DWS - Domestic Water Supply (applicable at existing points of public water supply)

OMS - Standards applicable specifically to the main stem of the Ohio River

ACLs calculated based on average flow in Ohio River of 11,000 cfs and a groundwater discharge rate of 10 cfs.

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SECTION 2

SITE CONDITIONS

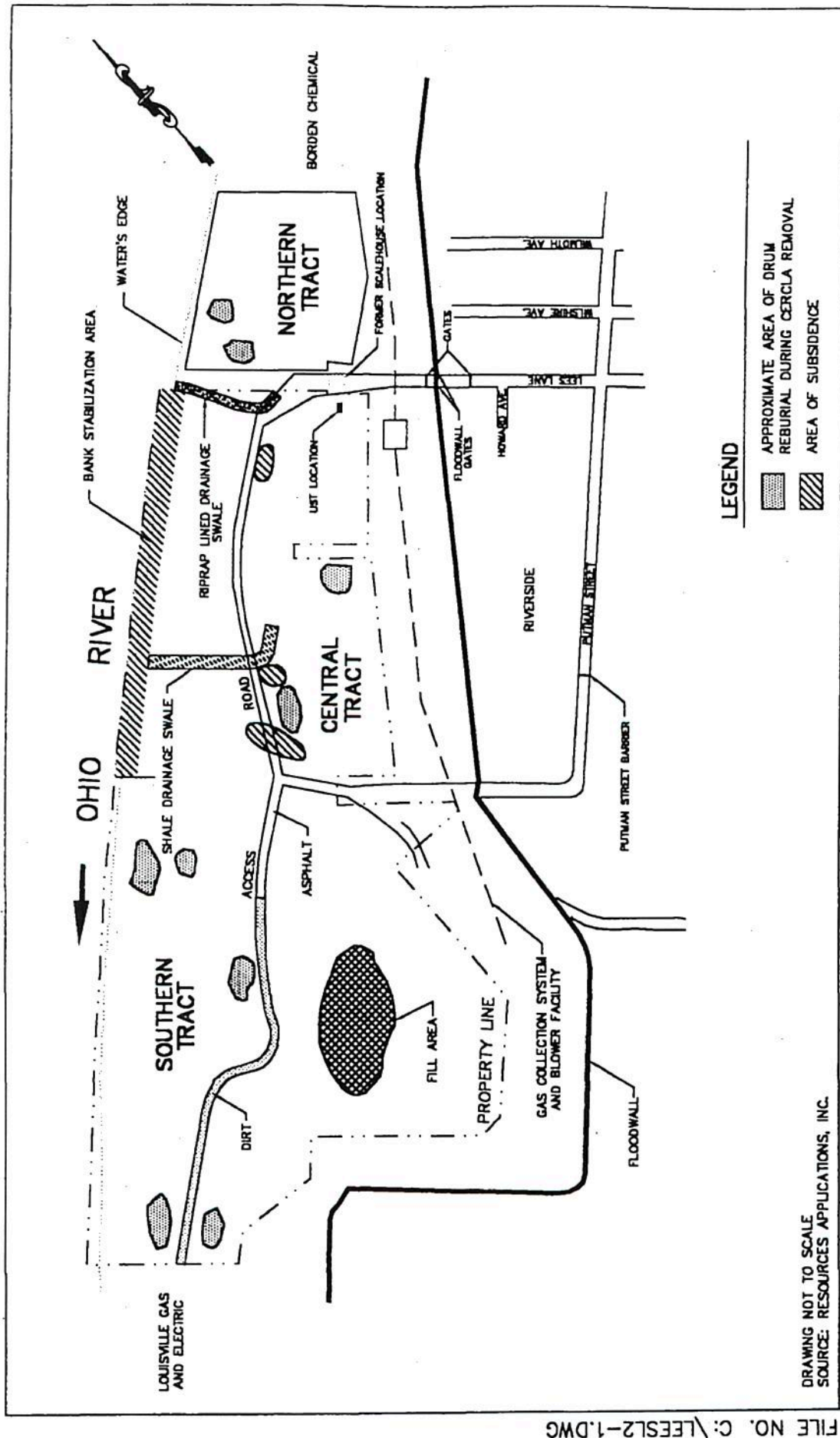
A site visit was conducted in May 1997 by WESTON to review the site conditions, the site groundwater monitoring system, and the gas collection system, and to observe groundwater sampling by Jefferson County Metropolitan Sewer District (MSD) personnel and gas sampling by Radian Corporation and personnel from Jefferson County MSD.

2.1 ENTRANCE GATES

Figure 2-1 shows the location of the gates within the Lees Lane Landfill site. The only existing gate is located along Lees Lane, approximately 100 feet west of Howards Avenue. This gate consists of two steel guardrail barriers which are interconnected and lock in the middle. At the time of the site visit, this gate was locked and was in good condition. This gate was apparently constructed in 1992.

A second barrier gate was present approximately 150 feet west of the first gate; however, the right hand side of the gate was missing and, therefore, the gate could no longer be locked. This gate is adjacent to the entrances to the track on the top of the floodwall.

Two other gates are present at the entrances to the floodwall. A southern gate consisting of two square panels was found to be in good condition but unlocked. A cable gate at the northern entrance to the floodwall was locked but was lying very close to the ground surface. Photographs 1 and 2 in Appendix D show these two gates.



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FEATURE MAP

FIGURE 2-1

2.2 ACCESS ROAD

The site access road is an asphalt paved road and begins at the main gate following a western route over the floodwall, past the gas collection system and the former location of the scalehouse (Figure 2-1).

Past this area, the road turns southwest and runs along the southern edge of the clay cap area of the landfill central tract. At the western end of the central tract, the road splits in two. The southern split crosses over the western end of the gas collection system and would reconnect with the Old Putnam Street except for the barrier across the road in the Riverside Garden neighborhood. The western split becomes a dirt road approximately 200 feet from the split and eventually leads to the location of groundwater monitoring well MW-05. After the MW-05 location, the road becomes heavily rutted and much standing water is present in the ruts. The road appears to be heavily traveled by all terrain vehicles.

Several small and large scale depressions exist along the road within the area of the landfill's central tract. Beginning at the northern end of the road, these depressions are located along the road as follows (Figure 2-1):

- A 10-foot long by 5-foot wide area located at the southern end (on top of the fill area) of a drainage channel filled with rip rap.
- A 25-foot long by 20-foot wide depression that has been filled with sand bags, which are very weathered and the majority of which have split open.
- A slight depression in the center of the road at the central portion of the central track.
- A large depression at the southern end of the shale drain that crosses the road. This depression has caused a buckling of the roadway adjacent to the depression.

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- Another large depression located at the southern end of the access road within the central tract. This area is associated with a buckling of the road. The depression has also allowed ATVs to travel off the roadway and through the standing water that has collected within this area. Several ATV trucks were observed to enter and exit through the standing water in this depression.

Photographs 10 through 16 show these areas of depression within the access road.

2.3 CAPPED AREA/CENTRAL TRACT

During the site review, the capped area had a well established vegetative cover consisting predominantly of grasses ranging in height from about one foot to four feet tall. The height of vegetation is excessive and should be maintained at a height of 4 to 8 inches as specified in Section 4.6, Landfill, Surface and Cap Monitoring and Maintenance of the O & M Plan. As stated in this plan "Excessive grass height may reduce runoff away from the cover, may visually obstruct observations of the cover, and may damage the integrity of the cap." There were no depressions or tension cracks noted in the cap area. During the 1993 site review, a tension crack was noted east of the site access road. This crack could not be located during this review. No areas of erosion or active seeps or springs were seen in the capped area or at the eastern or western ends of the cap. During the 1993 site review, a small area of erosion was noted at the southwestern edge of the landfill. This area of erosion was not detected during this review and in fact, the area is heavily vegetated.

At the northeastern end of the cap exists a rip rap-lined drainage channel. This channel is heavily choked with grasses and other plants, and at the northern end of the channel (nearest the river), the rip rap is barely visible because of the intergrowth of plant life.

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During the 1993 site review, a weak zone was detected in the northern portion of the cap area. This zone was not detected during this review. WESTON noted, however, that one of the large depressions located in the access road appears to be adjacent to the southern terminus of where the weak zone was identified.

In the southwestern end of the cap area, a shale-lined drain is present. This drain is fed by a culvert running under the access road from the east. The western end of the pipe was partially visible, whereas the eastern end could not be found. Apparently, water on the eastern side of the access road is not traveling through the culvert and is either ponding or percolating into the underlying material.

In February 1996, representatives from the KNREPC noted in a report on the operations and maintenance of the site that subsidence on the eastern side of the drainage swale may have caused the culvert under the road to settle "so that the shale drainage swale drains away from rather than toward the river. The result of this subsidence is that surface water is infiltrating in an area which would percolate to groundwater and flow to the river, passing under the cap and possibly carrying contaminants to the river." As described by KNREPC, this situation may still exist at the site. However, during this site review, it was noted that the western end of the drainage swale does appear to be sloped toward the river.

2.4 BANK STABILIZATION AREA - CENTRAL TRACT

The rip rap-covered bank stabilization area appeared to be in good condition except for one area. Photographs 7, 8, and 9 illustrate the current conditions of this bank. The one exception is an area of channeling in the rip rap that may have occurred during flooding in the spring of 1997. The channeling only appears to have moved the rocks to different locations and did not erode into the cap material

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below. No other sloughing or eroded areas were noted in the bank. Trash and other debris were found on the rip rap but no hazardous materials were found. Vegetation, principally tall weeds and short trees, is growing along the water line of the rip rap bank. All survey monuments installed in the bank appeared to be in good condition.

2.5 NORTHERN TRACT AREA

A review of the northern tract area found that this area is inaccessible except on foot, as the tract is heavily wooded. Debris from flooding of the river was found throughout this area but no evidence of hazardous materials were encountered.

2.6 SOUTHERN TRACT AREA

The southern tract contains the largest land area of the three tracts and is predominantly a very wooded area. Access to the tract can be through the main access road or through a couple of ATV paths, which typically lead back to the floodwall area south of the site. The ATV paths are well worn and are large enough to accommodate a 4-wheel drive equipped automobile. During the review, a site walkover was conducted (based upon available maps), covering what was believed to be the area of the former fill location. Only trees, grasses, and weeds of various heights were found in this area.

2.7 GROUNDWATER MONITOR WELLS

During the 1997 site review, observations were made of all site-related groundwater monitoring wells. The general conditions of these wells are described in the following table:

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Well No.	Well(s) Locked?	Protective Casing Intact?	Pad(s) Condition	Barrier In Place?	Comments
MW - A	Yes	Yes	Good	Yes	Bullet holes present in protective casing. Barely visible casing because of burial by mud.
MW - B	Yes	Yes	Good	Yes	
MW - 02	Yes	Yes	Good	Yes	
MW - 04	Yes	Yes	NA	Yes	
MW - 05	Yes	Yes	?	Yes	

2.8 GAS SAMPLING WELLS

All site gas sampling wells (G-1 through G-5) were reviewed for the general conditions. Wells G-1 through G-4 are located adjacent to the southeastern side of the floodwall. Well G-5 is located near the corner of Putnam and Lees Lane. The condition of the wells is noted in the following table:

Well No.	Well(s) Locked?	Protective Casing Intact?	Pad(s) Condition	Barrier In Place?	Comments
G-1	Yes	Yes	Good	Yes	Dents in protective casings from bullets.
G-2	Yes	Yes	Good	Yes	Dents in protective casings from bullets.
G-3	Yes	Yes	Good	Yes	Dents in protective casings from bullets.
G-4	Yes	Yes	Good	Yes	Dents in protective casings from bullets.
G-5	Yes	Yes	Good	Yes	Fence cage around G-5 location; gate to cage unlocked; many weeds in and on cage.

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2.9 GAS COLLECTION SYSTEM

The gas collection system consists of a central blower house facility and northeastern and southwestern gas collection lines which connect to the blower house (Figure 2-1). The line oriented southwest is the largest of the two lines.

During the site review, the blower house was locked and appeared to be in good general condition except for numerous small and large caliber bullet holes in the outside walls. The interior of the building was not seen during the review. A motor for the blower was heard running.

A review of the gas collection lines revealed that all of the gas recovery wells were clearly marked; however, locating the surface expression of the wells was difficult in many cases because of excessive plant growth around the surface completion (Photographs 21 and 22). Although the blower house appeared to be operating, no hissing or suction noises were heard along either end of the collection lines. Many of the concrete collars of the gas recovery wells were turned, tilted, or broken.

2.10 UNDERGROUND STORAGE TANK

During the site review, the WESTON representative noted a rusted, bullet-hole-ridden, 20,000-gallon tank located near the former scalehouse location (Figure 2-1). Since the tank was partially buried and pipe connections were projecting from the tank, it is likely that this was an on-site underground storage tank during operation of the facility. Upon closer examination, some type of liquid was seen in the tank. A strong, petroleum-type odor was detected around the tank and emanating from holes in the tank walls. Photograph 29 presents a view of this tank. The western end of the tank was settled in approximately 2 feet of water.

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Emanating from the eastern end of the tank and stretching for approximately 150 feet north of the tank was a dead plant life zone. The width of the zone varied from approximately 8 to 35 feet. The zone terminated into a drainage swale oriented in a southerly direction. Photographs 30 and 31 illustrate the size and appearance of this area.

2.11 INTERVIEW SUMMARY

During the on-site review, WESTON interviewed personnel from RADIANT Corporation, who performed the quarterly air sampling, and personnel from the KNREPC. RADIANT personnel were asked if the air sampling procedures were routine and followed any set protocol. The response included a statement that each quarterly event was very routine and was a rather quick process. Louisville Metropolitan Sewer District (MSD) personnel assisted with each event, usually collecting ambient air samples. According to RADIANT personnel, the sampling was never difficult except for equipment malfunctions. The samples were always collected and shipped out for laboratory analysis on the same day. Irregularities in sample collection methods, sampling equipment, and sample procedures were very infrequent.

The KNREPC, Division of Waste Management was contacted for input from the State's perspective. The State representative stated that although there were difficulties in getting MSD to correct site problems, MSD will eventually fulfill the requirements as needed. He also stated that several problems have existed for quite some time on site, such as the areas of subsidence along the access road and there does not appear to be any effort to correct the situations.

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WESTON also interviewed Miss Evelyn J. Clark, a supervisor with the Industrial Waste Sampling Division of MSD. She has been in charge of the quarterly groundwater sampling activities at Lees Lane over the past five years. When asked if the sampling procedures were very routine or if the events were different each time, she stated that the sampling events were always routine and had become pretty efficient events on their own. The sampling events within the Riverside Garden area were always easy and completed in a short amount of time. She stated that because the sample requirements were always the same, the sampling methods never varied. The only problems encountered were when equipment malfunctioned or the road to MW-05 was muddy and slippery. The typical sampling event routine included set up of equipment, decontamination of equipment, well purging, sample collection, breakdown of equipment, and retrieval of samples by the analytical laboratory, Heritage Laboratories, Inc., of Louisville.

2.12 ADMINISTRATIVE CONTROLS

Quarterly inspection reports of the site have been providing an accurate description of the site over the past five years. These reports have also shown where consistent maintenance is lacking and allows interested parties to develop knowledge of the functionality of the site remediation system and monitoring points.

WESTON personnel visited the MSD office and reviewed the files on Lees Lane to check on completeness. The files were easily accessible and, after reviewing the information, were found to be complete with all laboratory analytical reports, quarterly inspection reports, and maintenance records. Background reports on the site were not in the file but were reportedly in the file warehouse of MSD.

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SECTION 3

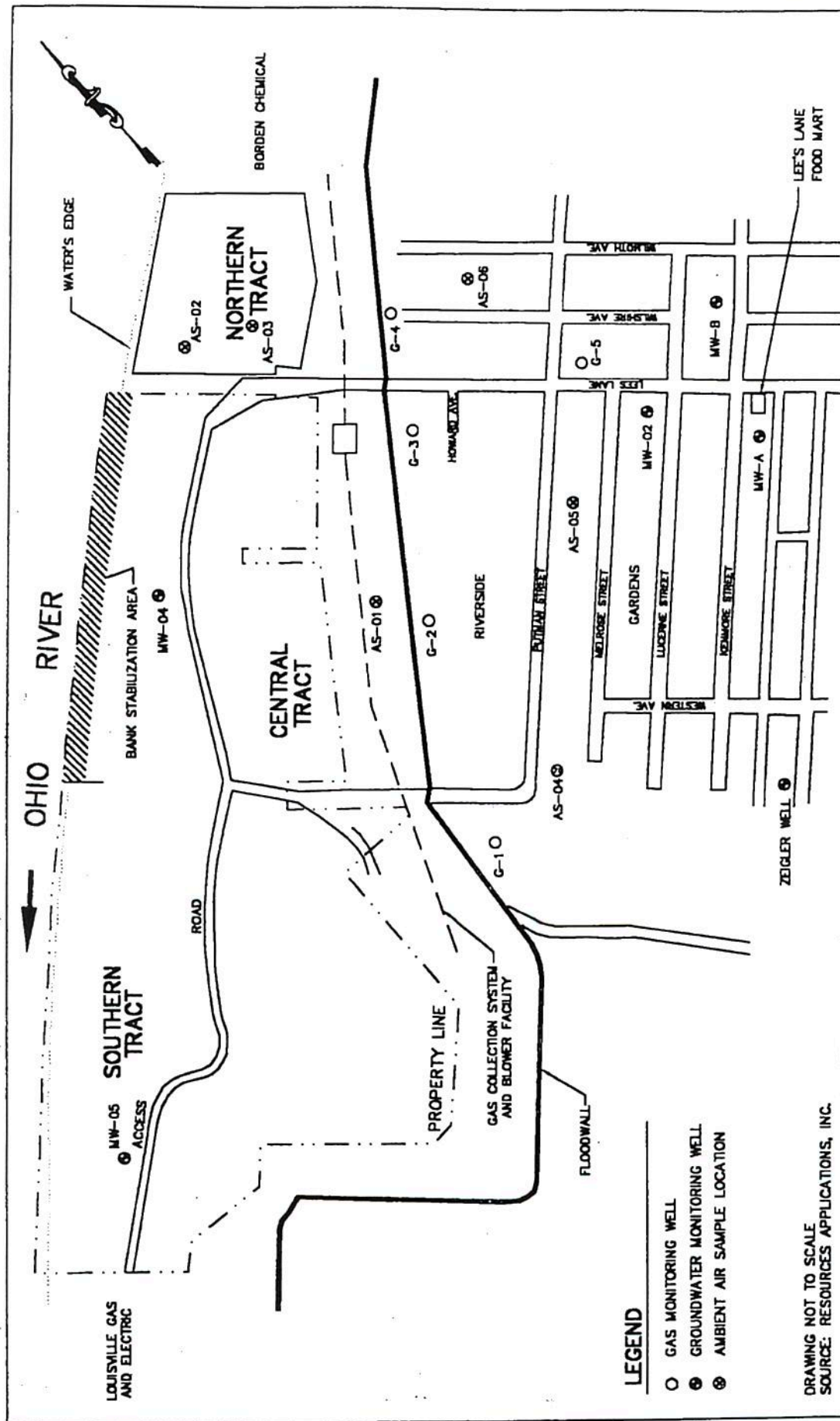
MATRIX SAMPLE ANALYTICAL RESULTS

3.1 GROUNDWATER SAMPLING

During the 1997 site review, WESTON personnel observed the collection of groundwater samples from two monitoring wells, MW-A and MW-B (Figure 3-1). WESTON was monitoring for quality control, decontamination procedures, sample handling, and other general procedural considerations. During the sampling events, WESTON found that all procedures and sample handling were, in general, in agreement with standard field operating procedures as established by the Science and Ecosystems Services Division of EPA Region 4, May 1996. However, there were a few questionable practices including:

- During the sample collection process (post-purging), the personnel holding the bailer for VOC samples did not wear gloves on their hands; however, the person holding the sample bottle did.
- During decontamination procedures, personnel performing the procedures did not wear gloves.
- Gasoline canisters were found to be stored in the truck beside or immediately adjacent to decontamination equipment, bailers, rope, and other sampling equipment.

WESTON has reviewed available groundwater sample analytical results for the years 1993 through 1996. During these years, samples were consistently collected from monitoring wells MW-A, MW-B, MW-02, MW-04, and MW-05 and were analyzed for total metal, volatile organic contaminant (VOC) and pesticides concentrations. The results of these analyses, where concentrations reported exceeded



LEGEND

- GAS MONITORING WELL
- GROUNDWATER MONITORING WELL
- ⊗ AMBIENT AIR SAMPLE LOCATION

DRAWING NOT TO SCALE
SOURCE: RESOURCES APPLICATIONS, INC.

ARCS / LEE'S LANE LANDFILL
LOUISVILLE, KENTUCKY

SAMPLING LOCATIONS

FIGURE 3-1



MANAGERS DESIGNERS/CONSULTANTS

DRAWN	DATE	DES. ENG.	DATE	V. D. NO.
CHECKED	DATE	APPROVED	DATE	DWG. NO.
WRS	9/97			04400-083
				LEESL2-2

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the EPA established standards can be found in Tables A1 through A6 of Appendix A.

On average, samples from monitoring wells MW-A, MW-B, and MW-02 revealed exceedances of iron and manganese with random occurrences of chromium and lead. The concentrations of chromium and lead were either detected at or within an order of magnitude of the MCL.

The contaminants detected within monitor wells MW-04 and MW-05 include the metals arsenic, cadmium, antimony, iron, lead, and manganese. Lead has been consistently detected within samples from either MW-04 or MW-05 since the fourth quarter of 1992 and, when detected in samples from MW-05, the concentrations are usually an order of magnitude greater than the MCL; however, those concentrations are significantly below the ACL. Arsenic detections within samples from MW-05 also tend to be an order of magnitude greater than the MCL but lower than the ACL. Iron concentrations, when detected, were on average 100 to 200 percent greater than the MCL but never exceeded the ACL.

3.2 AIR AND GAS SAMPLING

Both gas monitoring well data and ambient air sampling data are summarized in Appendix B and C, respectively. The sampling effort is conducted to evaluate the potential impacts to the surrounding community due to the generation of methane and other organic gas from the landfill. Although concentrations of methane and other organic gases exist, they are at low concentrations and well below the lower explosive limits (LEL) for these gases. The Kentucky Administrative Regulations establish the standards for explosive gas from landfills which state the maximum levels of gases shall not exceed 25 percent of the LEL in facility structures or the LEL at the property boundaries. For methane, the LEL is 5 percent by volume (50,000 ppm). The highest level reported in any gas

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monitoring well at the property boundary has been 1.052 ppm, which is well below the Kentucky standard.

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SECTION 4

RECOMMENDATIONS

4.1 ENTRANCE GATES

Currently, the gates and barriers to the site will prevent all traffic operating on the roadways from gaining access to the site. The lock on the front entrance gate at Lees Lane must be maintained in order to establish control over vehicle traffic on the landfill. The gates to the floodwall at Lees Lane should have locks restored and the gates improved so that access will be limited. The lack of fencing between the site and adjacent residential property, however, will create difficulty in establishing control over vehicle traffic on the property. Recommendations similar to this for restricting vehicular traffic and maintaining barricades were made in the 1993 RAI report.

4.2 ACCESS ROAD

At the very least, monitoring of the areas of subsidence along the access road should continue on a quarterly basis. However, to decrease the chances of percolation of surface water into and through the buried waste, the larger areas of subsidence should be filled with appropriate low hydraulic conductivity materials to minimize stormwater infiltration. Also, the areas of subsidence should be backfilled where runoff will be directed away from the capped area to prevent ponding of water.

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4.3 CAPPED AREA

The grass cover on the cap should be mowed regularly during the appropriate season to allow any storm water falling on the surface to run off and prevent percolation into the waste below. In addition, during mowing periods, or at least quarterly, the cap should be inspected for areas of erosion or settling.

4.4 BANK STABILIZATION AREA

Inspection of the rip rap-lined bank should be performed quarterly to continue monitoring erosional effects of the river. Trees and weeds at the rivers edge should be kept to a minimum. Survey monuments within the rip rap should be maintained and a proper ground survey of the area conducted to determine if any shifting or settling of the bank has occurred. If any erosion or removal of the rip rap is caused by the river, immediate efforts should be taken to replace the material.

4.5 GROUNDWATER AND GAS MONITOR WELLS

The groundwater and gas monitor wells, both on site and off site, should be inspected quarterly to ensure that each well is locked and that vandalism has not occurred. Where damage has occurred, the affected equipment should be replaced in order to maintain integrity of the well.

4.6 GAS COLLECTION SYSTEM

The gas collection system will continue to require maintenance work as long as the system is in operation. Based on gas sampling results, the landfill continues to produce methane; therefore,

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maintenance of the system components is necessary on a regular basis. The heavy vegetative growth around the well heads needs to be removed so that inspections may occur without hindrance. The concrete collars around the well heads should be replaced if damaged or broken. The entire system should be brought up to operating specifications and then allowed to run at full capacity. Balancing of the system should be enacted immediately and documentation should be provided to EPA to prove that the operation has been completed.

4.7 UNDERGROUND STORAGE TANK

The approximate 20,000-gallon underground storage tank and its contents should be investigated. A site investigation, according to State of Kentucky regulations, should also be conducted. The investigation should at least include the following: (1) soil samples from the surface and at depth from areas underneath the tank when the tank is removed and from at least five locations within the dead plant zone area; (2) groundwater samples utilizing HydroPunch or direct push sample technologies should be collected from two locations underneath the present location of the tank and from approximately three locations with or adjacent to the dead plant zone area. The results of the sample analyses with an accompanying discussion should be presented in a report to KNREPC and EPA.

4.8 ADMINISTRATIVE CONTROLS

Based on the findings in this review, the response action conducted by EPA at the Lees Lane Landfill remains protective of human health and the environment but needs routine O&M to assure that remedy will remain effective. Three of the four objectives outlined in the EDD appear to have been accomplished. Elevated metals levels, specifically chromium, detected in the RI/FS have decreased significantly in both on and off-site groundwater wells; the possibility of exposure to the on-site waste

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through direct contact has been reduced to negligible levels with the installation of the clay capping over soil "hot spot" areas; and ambient air sampling has revealed that hazardous gases are only occurring in low levels.

The gas collection system will continue to require balancing and maintenance. Historically, the landfill has produced dangerous levels of methane so proper maintenance of the system is imperative.

The levels of chromium in groundwater detected in the five years of routine O&M quarterly sampling conducted by EPA were significantly lower than the levels detected during the RI/FS. The highest concentration of chromium detected in the RI/FS was 2,320 $\mu\text{g/l}$ in an on-site well. The highest level detected in the past five years was 120 $\mu\text{g/l}$ in off-site upgradient well MW-A in October 1992.

The high levels of iron and manganese detected in the off-site wells may be due to naturally occurring levels in the surrounding aquifer or may come from an upgradient source. In either case, the threat to human health is insignificant due to the low toxicity of these elements. Antimony has been detected at levels higher than the MCL in MW-05 at various periods but not significantly since the fourth quarter of 1994. The levels of cadmium detection have been far below the level of the ACL.

Based on the available analytical data for groundwater, the quarterly groundwater sampling event could be changed to an annual event for all monitoring wells.

The ambient air and gas well sampling should continue to be conducted quarterly in accordance with the April 1991 O&M Plan. The landfill is still producing methane and other gases, thus warranting the monitoring of the levels of these contaminants. The gas well sampling data will indicate if there is off-site subsurface gas migration and would suggest problems with the gas collection system.

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Quarterly site inspections should also be maintained. Until such time it can be proven that the site has met all the public health concerns expressed in the EDD, the only measure of the site's appearance and the operation and condition of the collection system and monitoring wells is through the quarterly report.

4.9 STATEMENT OF PROTECTIVENESS

The response action conducted by EPA at the Lees Lane Landfill remains protective of human health and the environment, but the gas collection system still requires maintenance. The public health concerns identified in the EDD were: (1) the elevated levels of chromium in the groundwater; (2) possible inhalation of hazardous gases in the ambient air; (3) the potential for release of hazardous gases to the subsurface; and (4) the possibility of exposure to contaminants through direct contact with the wastes. As previously mentioned, concerns 1, 2, and 4 have been reduced significantly, but the condition of the gas collection system increases the ability for subsurface gases to migrate off site to the Riverside Gardens subdivision. Implementation of maintenance and corrective activities to bring the system up to standards would ensure that the site does not present a human health risk.

4.10 NEXT REVIEW

EPA plans to conduct the next Five-Year Review by no later than June 2003.

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Appendix

APPENDIX A

QUARTERLY GROUNDWATER SAMPLING DATA

Table A1

Lees Lane Landfill
Quarterly Groundwater Sample Data

Parameter Detected	Maximum Contaminant Level (mg/L)	LL-MW-A												
		01	02	03	04	05	07	08	09	10	12	13	15	17
Chromium	0.1	10/19/92	2/23/93	5/25/93	8/24/93	11/16/93	6/8/94	9/13/94	11/22/94	3/22/95	9/30/95	12/14/95	5/22/96	12/12/96
Iron	0.3 ^{SMCL}	0.12	--	--	--	--	--	--	--	--	--	--	--	--
Manganese	0.05 ^{SMCL}	3.9	0.45	0.47	0.42	0.74	0.49	0.52	0.57	0.66	1.3	0.44	0.57	0.52
Lead	0.015	0.38	0.052	--	--	0.075	--	--	0.032	--	0.059	--	--	--
Antimony	0.006	--	--	--	--	--	--	--	--	--	--	--	--	--
Cadmium	0.005	--	--	--	--	--	--	--	--	--	--	--	--	--
Arsenic	0.05	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichloroethane	0.005	--	--	--	--	--	--	--	--	--	--	--	--	--
Trichloroethene	0.005	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-ethylhexyl)phthalate	0.006	--	--	--	--	--	--	--	--	--	--	--	--	--

Notes:

All concentrations reported in milligrams per liter.

-- = Compound not detected.

SMCL = Secondary Maximum Contaminant Level.

LL = Lees Lane.

MW = Monitoring Well.

Table A2

Lees Lane Landfill
Quarterly Groundwater Sample Data

Parameter Detected	Maximum Contaminant Level (mg/L)	LL-MW-B																	
		01	02	03	04	05	06	07	08	09	10	11	12	12D	OB-13	FB-13	15	16	17
Chromium	0.1	10/19/92	2/23/93	5/25/93	8/24/93	11/16/93	3/16/94	6/8/94	9/13/94	11/22/94	3/22/95	6/28/95	9/30/95		12/14/95		5/22/96	3/6/96	12/12/96
Iron	0.3 ^{SMCL}	1.1	0.55	0.64	0.34	0.63	4.5	1.0	1.0	0.54	0.61	1.4	0.70	0.30	0.35	2.8	0.94	0.39	0.40
Manganese	0.05 ^{SMCL}	0.76	0.48	--	0.37	0.41	1.2	0.52	0.45	0.31	0.30	0.50	0.36	0.36	0.27	0.12	0.16	0.18	0.21
Lead	0.015	--	--	--	--	--	--	--	--	--	--	--	0.038	--	--	--	--	--	--
Antimony	0.006	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cadmium	0.005	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Arsenic	0.05	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichloroethane	0.005	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trichloroethene	0.005	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-ethylhexyl)phthalate	0.006	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Notes:

All concentrations reported in milligrams per liter.

-- = Compound not detected.

SMCL = Secondary Maximum Contaminant Level.

LL = Lees Lane.

MW = Monitoring Well.

Table A3

Lees Lane Landfill
Quarterly Groundwater Sample Data

Parameter Detected	Maximum Contaminant Level (mg/L)	LL-MW-02															
		01 10/19/92	02 2/23/93	03 5/25/93	04 8/24/93	05 11/16/93	06 3/16/94	07 6/8/94	08 9/13/94	09 11/22/94	10 3/22/95	11 6/28/95	13 12/14/95	15 5/22/96	16 9/24/96	17 12/12/96	
Chromium	0.1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
Iron	0.3 ^{SMCL}	2.8	3.0	2.9	3.0	2.8	2.9	3.2	3.1	3.2	3.4	3.5	3.0	2.8	3.6	3.5	4.2
Manganese	0.05 ^{SMCL}	0.11	0.12	0.11	0.13	0.11	0.1	0.10	0.13	0.11	0.099	0.13	0.11	0.12	0.13	0.15	--
Lead	0.015	--	--	--	--	--	--	--	--	--	--	--	--	--	0.015	--	--
Antimony	0.006	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cadmium	0.005	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Arsenic	0.05	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichloroethane	0.005	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trichloroethene	0.005	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-ethylhexyl)phthalate	0.006	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Notes:

All concentrations reported in milligrams per liter.

-- = Compound not detected.

SMCL = Secondary Maximum Contaminant Level.

LL = Lees Lane.

MW = Monitoring Well.

Table A4

Lees Lane Landfill
Quarterly Groundwater Sample Data

Parameter Detected	Alternate Concentration Limit (mg/L)	L.L.-MW-04															
		01	01D	02	02D	03	03D	04	05	06	07	08	09	10	11	12	13
		10/19/92	2/23/93	5/25/93	8/24/93	11/16/93	3/16/94	6/8/94	9/13/94	11/22/94	3/22/95	6/28/95	9/30/95	12/14/95	5/22/96	9/24/96	12/12/96
Chromium	55	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Iron	1,100	5.9	5.9	7.2	6.5	6.3	6.2	6.0	5.8	7	6.4	6.5	6.2	6.3	5.9	7.2	8.6
Manganese	55	0.16	0.15	0.17	0.16	--	0.16	0.16	0.15	0.16	0.16	0.15	0.14	0.15	0.13	0.14	0.2
Lead	55	--	0.018	0.028	0.021	--	--	--	--	0.12	--	0.035	0.021	--	--	0.016	0.039
Antimony	{0.006}	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cadmium	13.2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Arsenic	55	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichloroethane	{0.005}	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trichloroethene	{0.005}	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-ethylhexyl)phthalate	{0.006}	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Notes:

All concentrations reported in milligrams per liter.

-- = Compound not detected.

{ } = Maximum Contaminant Level (MCL)

L.L. = Lees Lane

MW = Monitoring Well.

Table A5

Lees Lane Landfill
Quarterly Groundwater Sample Data

Parameter Detected	Alternate Concentration Limit (mg/L)	LL-MW-05																							
		01	02	03	04	05	06	06D	07	08	09	09D	10	10D	11	11D	12	13	15	15D	16	16D	17	17D	
		10/19/92	2/23/93	5/25/93	8/24/93	11/16/93	3/16/94	6/8/94	9/13/94	11/22/94	3/22/95	6/28/95	9/30/95	12/14/95	5/22/95	9/24/96	12/12/96								
Chromium	55	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Iron	1,100	110	41	130	--	55	21	29	110	140	120	44	14	43	110	90	70	240	48	64	46	64	17	43.00	
Manganese	55	0.98	0.72	1.1	--	0.82	0.58	0.56	1.1	1.0	1.2	0.95	1.1	1.2	1.2	1.2	0.97	1.3	0.76	0.83	0.71	0.72	--	0.67	
Lead	55	1.3	0.43	0.72	0.99	0.39	0.090	0.22	0.62	0.24	0.30	0.30	0.06	0.18	0.21	0.20	0.23	0.32	0.06	--	0.52	0.46	0.14	0.18	
Antimony	{0.006}	0.036	--	--	--	0.043	--	--	--	0.042	0.043	--	--	--	--	--	--	--	--	--	--	--	--	--	
Cadmium	13.2	0.0092	0.0053	--	--	--	--	--	--	0.0053	0.0050	--	--	--	--	--	0.0054	--	--	--	--	--	--	--	
Arsenic	55	0.80	0.30	--	2.6	0.36	0.12	0.18	0.38	0.72	0.85	0.29	--	0.24	0.55	0.56	0.53	1.6	0.30	--	0.26	0.46	0.070	0.26	
1,2-Dichloroethane	{0.005}	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
Trichloroethene	{0.005}	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
Bis(2-ethylhexyl)phthalate	{0.006}	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	

Notes:

All concentrations reported in milligrams per liter.

-- = Compound not detected.

{ } = Maximum Contaminant Level (MCL)

LL = Lees Lane

MW = Monitoring Well.

Table A6

Lees Lane Landfill
Quarterly Groundwater Sample Data

Parameter Detected	Maximum Contaminant Level (mg/L)	Trip Blank		LL-FB-07
		2/23/93	11/16/93	
Chromium	0.1	--	--	--
Iron	0.3 ^{SMCL}	--	--	--
Manganese	0.05 ^{SMCL}	--	--	--
Lead	0.015	--	--	--
Antimony	0.006	--	--	--
Cadmium	0.005	--	--	--
Arsenic	0.05	--	--	--
1,2-Dichloroethane	0.005	0.005	--	--
Trichloroethene	0.005	--	8	--
Bis(2-ethylhexyl)phthalate	0.006	--	--	45

Notes:

All concentrations reported in milligrams per liter.

-- = Compound not detected.

SMCL = Secondary Maximum Contaminant Level.

LL = Lees Lane.

MW = Monitoring Well.

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APPENDIX B

GAS WELL SAMPLING DATA

Table B1
Data Summary for Gas Well Sample G-1
Lees Lane Landfill Superfund Site
Louisville, Kentucky

Compound	Sample Date															
	11/92	2/93	5/93	8/93	11/93	3/94	6/94	9/94	11/94	3/95	6/95	9/95	12/95	3/96	5/96	9/96
Benzene	0.26	0.24	<0.85	<0.50	0.26	<0.50	<0.50	1.03	0.17	0.21	0.21	1.66	0.50	0.06	0.15	0.06
Toluene	0.47	0.14	<0.85	<0.50	2.30	0.52	5.73	3.71	0.21	0.58	1.72	10.25	2.22	0.20	0.47	0.25
Xylene (total)	0.45	0.13	<0.85	<0.50	<0.75	<0.50	1.61	1.43	0.16	0.36	0.76	6.20	1.20	0.06	0.76	0.07
Methylene Chloride	ND	0.68	<0.85	<0.50	<0.30	<0.50	<0.50	0.11	0.07	0.25	0.54	0.49	<0.01	<0.01	0.10	0.01
Vinyl Chloride	ND	ND	<0.85	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ND
Methane	ND	4.8	2.08	1.70	2.13	3.52	1052	3.11	3.28	2.82	2.85	2.72	4.05	51.84	ND	1.80

Notes:

ND = Not detected.

All concentrations reported in parts per billion (ppb) volume.

Tabulated values obtained from quarterly reports prepared by RADIAN Corporation.

Table B2
Data Summary for Gas Well Sample G-2
Lees Lane Landfill Superfund Site
Louisville, Kentucky

Compound	Sample Date															
	11/92	2/93	5/93	8/93	11/93	3/94	6/94	9/94	11/94	3/95	6/95	9/95	12/95	3/96	5/96	9/96
Benzene	0.19	0.05	<0.80	<0.50	0.11	<0.50	<0.50	0.15	0.21	0.09	0.13	0.08	0.09	0.05	0.12	0.13
Toluene	0.26	0.03	1.0	<0.50	0.23	<0.50	1.06	0.89	0.24	0.34	0.58	0.53	0.32	0.19	0.43	0.55
Xylene (total)	0.28	0.06	<0.80	<0.50	<0.20	<0.50	<0.50	0.26	0.22	0.17	0.45	0.28	0.19	<0.01	0.39	0.13
Methylene Chloride	ND	0.29	<0.80	<0.50	<0.30	<0.50	<0.50	<0.50	0.06	1.99	0.05	<0.01	<0.01	<0.01	0.88	0.06
Vinyl Chloride	ND	ND	<0.80	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ND
Methane	ND	3.60	2.06	0.05	0.75	3.07	0.89	3.63	3.46	1.11	2.94	<0.9	1.73	2.62	5.56	0.87

Notes:

ND = Not detected.

All concentrations reported in parts per billion (ppb) volume.

Tabulated values obtained from quarterly reports prepared by RADIAN Corporation.

Table B3
Data Summary for Gas Well Sample G-3
Lees Lane Landfill Superfund Site
Louisville, Kentucky

Compound	Sample Date															
	11/92	2/93	5/93	8/93	11/93	3/94	6/94	9/94	11/94	3/95	6/95	9/95	12/95	3/96	5/96	9/96
Benzene	0.19	0.26	<0.75	<0.50	0.12	<0.50	<0.50	0.15	0.06	0.15	0.10	0.51	0.10	0.07	0.09	0.12
Toluene	0.29	0.16	<0.75	<0.50	0.27	<0.50	<0.50	0.91	0.09	0.24	0.42	4.27	0.36	0.34	0.34	0.33
Xylene (total)	0.26	0.11	<0.75	<0.50	<0.20	<0.50	<0.50	0.29	0.11	0.23	0.31	1.25	0.21	0.08	0.23	0.13
Methylene Chloride	ND	0.32	<0.75	<0.50	<0.30	<0.50	<0.50	<0.50	0.02	0.83	0.05	0.19	<0.01	<0.01	0.46	0.05
Vinyl Chloride	ND	ND	<0.75	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ND
Methane	ND	4.3	0.84	1.40	0.88	2.10	0.86	3.73	2.36	2.49	2.90	3.88	2.37	1.94	4.24	0.89

Notes:

ND = Not detected.

All concentrations reported in parts per billion (ppb) volume.

Tabulated values obtained from quarterly reports prepared by RADIAN Corporation.

Table B4
Data Summary for Gas Well Sample G-4
Lees Lane Landfill Superfund Site
Louisville, Kentucky

Compound	Sample Date															
	11/92	2/93	5/93	8/93	11/93	3/94	6/94	9/94	11/94	3/95	6/95	9/95	12/95	3/96	5/96	9/96
Benzene	0.12	0.07	<0.75	<0.50	0.40	<0.50	0.63	0.61	0.91	0.18	NA	0.51	0.66	<0.01	0.05	0.13
Toluene	0.15	0.04	<0.75	<0.50	4.51	2.27	7.24	2.47	3.54	2.21	NA	4.60	2.45	0.23	0.28	0.42
Xylene (total)	0.12	0.03	<0.75	<0.50	1.27	<0.50	2.15	1.20	4.80	0.57	NA	1.35	1.16	0.08	0.21	0.16
Methylene Chloride	ND	0.60	<0.75	<0.50	<0.30	1.42	1.76	<0.50	0.33	1.48	NA	0.20	0.18	<0.01	0.65	0.05
Vinyl Chloride	ND	ND	<0.75	<0.50	<0.50	<0.50	0.60	<0.50	<0.50	<0.01	NA	<0.01	<0.01	<0.01	<0.01	ND
Methane	ND	7.40	1.98	0.57	1.20	2.26	2.52	3.39	2.90	2.82	NA	3.24	4.25	1.92	3.08	0.88

Notes:

ND = Not detected.

All concentrations reported in parts per billion (ppb) volume.

Tabulated values obtained from quarterly reports prepared by RADIAN Corporation.

Table B5
Data Summary for Gas Well Sample G-5
Lees Lane Landfill Superfund Site
Louisville, Kentucky

Compound	Sample Date															
	11/92	2/93	5/93	8/93	11/93	3/94	6/94	9/94	11/94	3/95	6/95	9/95	12/95	3/96	5/96	9/96
Benzene	0.28	0.05	<0.70	<0.50	0.33	<0.50	<0.50	0.29	0.18	0.21	0.12	0.71	0.11	0.03	0.25	0.24
Toluene	2.49	0.04	<0.70	<0.50	0.61	<0.50	2.85	0.78	0.27	0.76	0.57	2.78	0.39	0.41	1.52	0.58
Xylene (total)	0.58	0.03	<0.70	0.54	0.43	<0.50	0.74	0.29	0.23	0.31	0.32	2.06	0.31	<0.01	0.74	0.20
Methylene Chloride	ND	1.10	<0.70	<0.50	<0.30	<0.50	<0.50	<0.50	0.06	0.30	0.05	0.10	<0.01	0.301	0.84	0.06
Vinyl Chloride	ND	ND	<0.70	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.47
Methane	ND	5.00	1.24	0.92	2.26	2.20	2.10	1.29	2.94	2.46	3.99	2.39	1.87	1.89	3.36	0.82

Notes:

ND = Not detected.

All concentrations reported in parts per billion (ppb) volume.

Tabulated values obtained from quarterly reports prepared by RADIAN Corporation.

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APPENDIX C

AMBIENT AIR SAMPLING DATA

Table C1
Data Summary for Ambient Air Sample R1
Lees Lane Landfill Superfund Site
Louisville, Kentucky

		Sample Date													
Compound	2/93	5/93	8/93	11/93	3/94	6/94	9/94	11/94	3/95	6/95	9/95	12/95	3/96	5/96	9/96
Benzene	0.24	<.80	<0.50	0.34	<0.50	0.57	0.17	0.18	0.22	0.08	0.37	0.79	0.29	0.22	0.15
Toluene	0.17	<.80	<0.50	1.05	<0.50	3.15	1.35	0.21	1.29	0.23	2.81	3.31	0.66	0.49	0.21
Xylene (total)	0.12	<.80	<0.50	0.57	<0.50	1.13	0.48	0.16	0.39	0.13	0.98	1.33	0.44	0.43	0.10
Methylene Chloride	0.65	1.1	<0.50	1.94	2.42	19.13	6.91	1.28	2.71	5.53	9.42	0.44	0.30	0.46	0.30
Vinyl Chloride	ND	<.80	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.01	<0.01	<0.01	0.13	<0.01	<0.01	ND
Methane	ND	1.68	2.16	2.35	2.05	2.63	3.87	3.11	2.41	3.29	2.54	4.16	3.06	3.50	1.04

Notes:

ND = Not detected.

All concentrations reported in parts per billion (ppb) volume.

Tabulated values obtained from quarterly reports prepared by RADIAN Corporation.

Table C2
Data Summary for Ambient Air Sample R2
Lees Lane Landfill Superfund Site
Louisville, Kentucky

Compound	Sample Date														
	2/93	5/93	8/93	11/93	3/94	6/94	9/94	11/94	3/95	6/95	9/95	12/95	3/96	5/96	9/96
Benzene	0.36	<0.75	<0.50	0.54	<0.50	0.52	0.22	0.57	0.21	0.12	0.50	0.68	0.19	0.21	0.15
Toluene	0.17	<0.75	<0.50	4.07	0.87	4.79	1.21	1.79	1.51	0.36	3.49	3.32	0.45	0.64	0.24
Xylene (total)	0.61	<0.75	<0.50	1.54	<0.50	1.48	0.61	2.09	0.42	0.19	1.44	1.37	0.45	0.29	0.11
Methylene Chloride	3.49	3.1	<0.50	<0.30	6.53	1.81	0.53	0.57	0.37	0.52	0.60	0.65	<0.01	0.56	0.08
Vinyl Chloride	ND	<0.75	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ND
Methane	1.8	2.07	1.57	1.99	2.22	2.32	3.90	3.41	2.49	2.94	2.45	4.51	3.33	3.68	0.90

Notes:

ND = Not detected.

All concentrations reported in parts per billion (ppb) volume.

Tabulated values obtained from quarterly reports prepared by RADIAN Corporation.

Table C3
Data Summary for Ambient Air Sample U1
Lees Lane Landfill Superfund Site
Louisville, Kentucky

Compound	Sample Date														
	2/93	5/93	8/93	11/93	3/94	6/94	9/94	11/94	3/95	6/95	9/95	12/95	3/96	5/96	9/96
Benzene	0.23	<0.80	0.62	0.36	<0.50	<0.50	0.14	0.20	0.18	0.10	0.31	0.54	0.09	0.15	0.18
Toluene	0.15	<0.80	<0.50	1.09	<0.50	2.15	0.74	0.21	1.15	0.55	2.23	2.83	0.30	0.43	0.31
Xylene (total)	0.09	<0.80	<0.50	0.71	<0.50	0.79	0.22	0.23	0.25	0.14	1.00	1.21	0.15	0.25	0.15
Methylene Chloride	0.53	<0.80	11	<0.30	1.01	14.53	0.74	0.11	0.20	0.66	0.89	0.78	<0.01	0.51	0.21
Vinyl Chloride	ND	<0.80	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.03
Methane	0.7	1.66	2.29	2.75	2.04	2.27	3.63	2.77	2.51	3.05	2.29	4.47	2.95	3.40	0.89

Notes:

ND = Not detected.

All concentrations reported in parts per billion (ppb) volume.

Tabulated values obtained from quarterly reports prepared by RADIAN Corporation.

Table C4
Data Summary for Ambient Air Sample B1
Lees Lane Landfill Site
Louisville, Kentucky

Compound	Sample Date	
	11/92	
Benzene	0.30	
Toluene	0.39	
Xylene (total)	0.31	
Methylene Chloride	ND	
Vinyl Chloride	ND	
Methane	ND	

Notes:

ND = Not detected.

All concentrations reported in parts per billion (ppb) volume.

Tabulated values obtained from quarterly reports prepared by RADIAN Corporation.

Table C5
Data Summary for Ambient Air Sample D1
Lees Lane Landfill Superfund Site
Louisville, Kentucky

Compound	Sample Date	
	11/92	
Benzene	0.20	
Toluene	0.37	
Xylene (total)	0.23	
Methylene Chloride	ND	
Vinyl Chloride	ND	
Methane	ND	

Notes:

ND = Not detected.

All concentrations reported in parts per billion (ppb) volume.

Tabulated values obtained from quarterly reports prepared by RADIAN Corporation.

Table C6
Data Summary for Ambient Air Sample A1
Lees Lane Landfill Superfund Site
Louisville, Kentucky

Compound	Sample Date															
	11/92	2/93	5/93	8/93	11/93	3/94	6/94	9/94	11/94	3/95	6/95	9/95	12/95	3/96	5/96	9/96
Benzene	0.38	0.19	<0.80	<0.50	0.31	<0.50	<0.50	2.00	2.67	0.21	0.11	0.31	0.57	0.08	0.22	0.14
Toluene	1.59	0.14	<0.80	5.30	1.03	<0.50	15.27	8.50	10.03	2.28	0.30	2.52	3.50	0.016	0.67	0.15
Xylene (total)	0.63	0.12	<0.80	<0.50	0.58	<0.50	1.58	3.87	13.79	0.53	0.14	0.78	1.39	0.07	0.49	0.05
Methylene Chloride	ND	<0.02	<0.80	11.0	<0.30	1.92	15.91	0.51	0.79	3.37	0.34	1.97	1.13	<0.01	2.22	0.36
Vinyl Chloride	ND	ND	<0.80	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ND
Methane	ND	0.03	1.92	1.49	2.06	2.34	2.53	3.86	3.33	2.50	3.38	2.46	3.97	5.20	3.76	1.14

Notes:

ND = Not detected.

All concentrations reported in parts per billion (ppb) volume.

Tabulated values obtained from quarterly reports prepared by RADIAN Corporation.

Table C7
Data Summary for Ambient Air Sample A2
Lees Lane Landfill Superfund Site
Louisville, Kentucky

Compound	Sample Date															
	11/92	2/93	5/93	8/93	11/93	3/94	6/94	9/94	11/94	3/95	6/95	9/95	12/95	3/96	5/96	9/96
Benzene	0.29	0.21	<0.80	0.60	0.39	<0.50	<0.50	0.21	0.18	0.22	0.12	0.55	0.65	0.09	0.20	0.13
Toluene	0.56	0.15	0.91	<0.50	1.09	<0.50	1.95	1.57	0.17	0.58	0.32	6.08	2.61	0.23	0.64	0.17
Xylene (total)	0.37	0.11	<0.80	<0.50	0.72	<0.50	1.49	0.49	0.15	0.36	0.20	1.62	1.14	0.08	0.46	0.08
Methylene Chloride	ND	1.96	1.7	<0.50	<0.30	<0.50	0.56	2.80	0.07	0.25	0.06	0.41	0.47	<0.01	1.79	1.02
Vinyl Chloride	ND	ND	<0.80	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ND
Methane	ND	11.4	2.25	2.25	2.3	2.00	3.08	3.92	3.34	2.59	3.29	2.68	4.28	5.21	5.52	0.99

Notes:

ND = Not detected.

All concentrations reported in parts per billion (ppb) volume.

Tabulated values obtained from quarterly reports prepared by RADIAN Corporation.

Table C8
Data Summary for Ambient Air Sample C1
Lees Lane Landfill Superfund Site
Louisville, Kentucky

Compound	Sample Date
	11/92
Benzene	0.28
Toluene	0.47
Xylene (total)	0.32
Methylene Chloride	ND
Vinyl Chloride	ND
Methane	ND

Notes:

ND = Not detected.

All concentrations reported in parts per billion (ppb) volume.

Tabulated values obtained from quarterly reports prepared by RADIAN Corporation.

Table C9
Data Summary for Ambient Air Sample C2
Lees Lane Landfill Superfund Site
Louisville, Kentucky

Compound	Sample Date
Benzene	11/92
Toluene	0.27
Xylene (total)	0.60
Methylene Chloride	0.30
Vinyl Chloride	ND
Methane	ND

Notes:

ND = Not detected.

All concentrations reported in parts per billion (ppb) volume.

Tabulated values obtained from quarterly reports prepared by RADIAN Corporation.

Table C10
Data Summary for Ambient Air Sample R3
Lees Lane Landfill Site
Louisville, Kentucky

	Sample Date														
Compound	2/93	5/93	8/93	11/93	3/94	6/94	9/94	11/94	3/95	6/95	9/95	12/95	3/96	5/96	9/96
Benzene	0.34	<0.70	0.58	0.36	<0.50	0.70	2.43	0.49	0.24	0.11	0.80	0.67	0.24	0.22	0.16
Toluene	0.80	<0.70	0.92	0.96	<0.50	3.45	8.63	0.92	1.35	0.35	4.75	3.59	0.66	0.63	0.15
Xylene (total)	0.38	<0.70	0.52	0.77	<0.50	1.44	8.69	1.07	0.71	0.26	2.74	1.85	0.56	0.38	0.08
Methylene Chloride	0.17	<0.70	<0.50	0.43	<0.50	3.22	0.76	0.07	0.43	0.56	0.21	0.22	<0.01	0.59	0.28
Vinyl Chloride	ND	<0.70	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ND
Methane	2.7	2.33	1.83	2.21	2.18	2.36	3.78	3.14	2.54	3.11	2.42	4.16	3.05	3.57	0.85

Notes:

ND = Not detected.

All concentrations reported in parts per billion (ppb) volume.

Tabulated values obtained from quarterly reports prepared by RADIAN Corporation.

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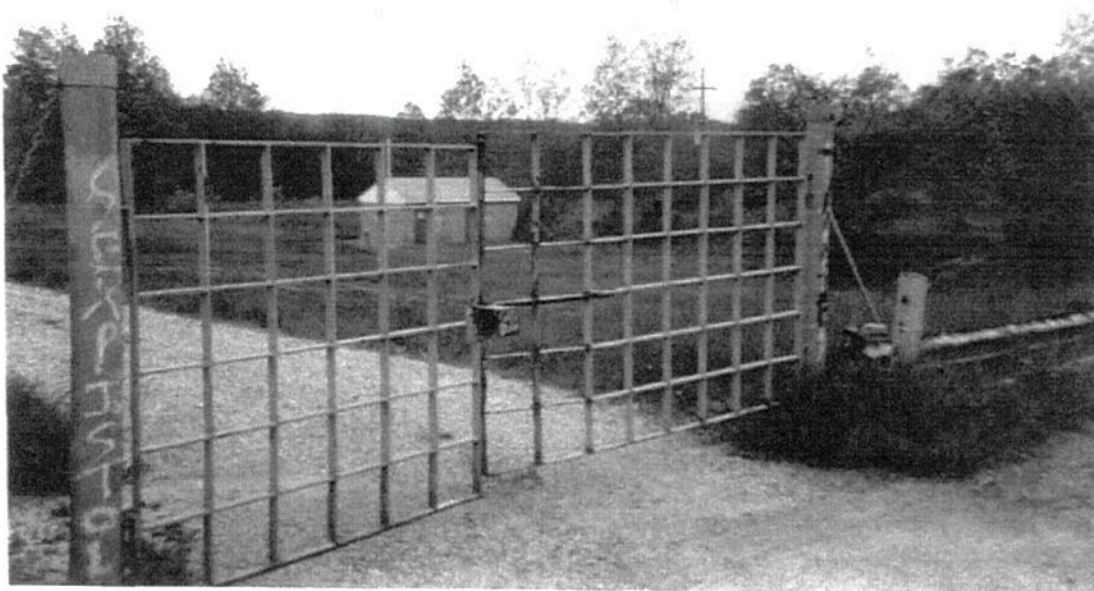
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APPENDIX D

PHOTOGRAPHIC DOCUMENTATION



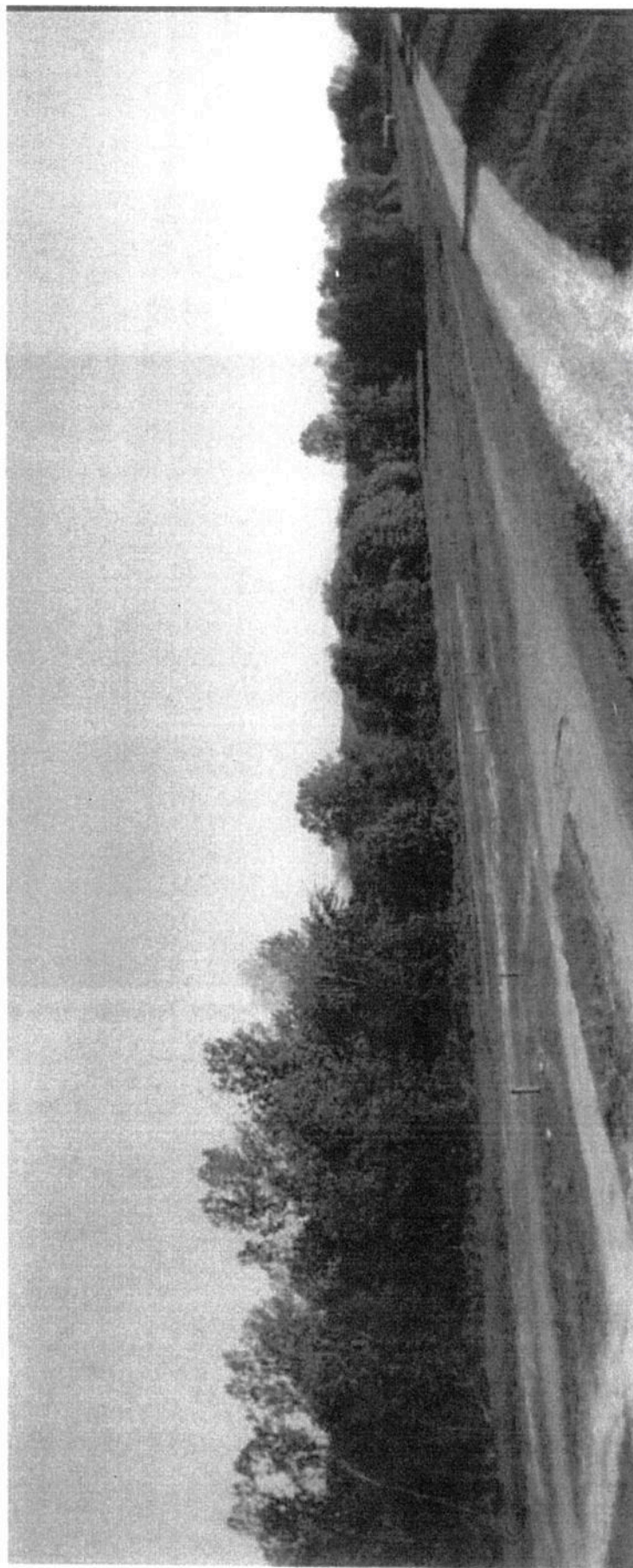
Photograph 1: Northeast view of cable gate and floodwall at main entrance to landfill. Note that the cable is very close to the ground surface.



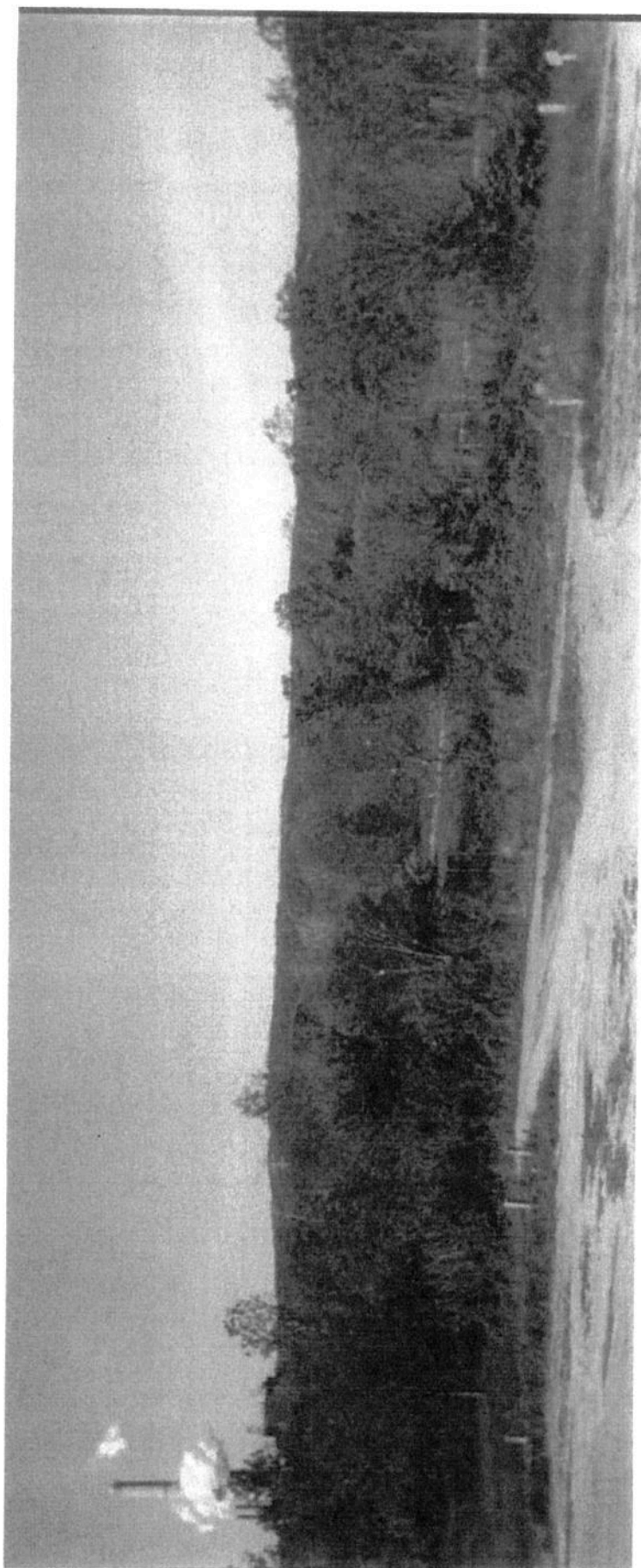
Photograph 2: Western view of gate at main entrance to landfill. This gate is entrance to southwestern portion of landfill and floodwall. Blower house in background.



Photograph 3: Barrier across former Putnam Street entrance to landfill. View to the southwest.

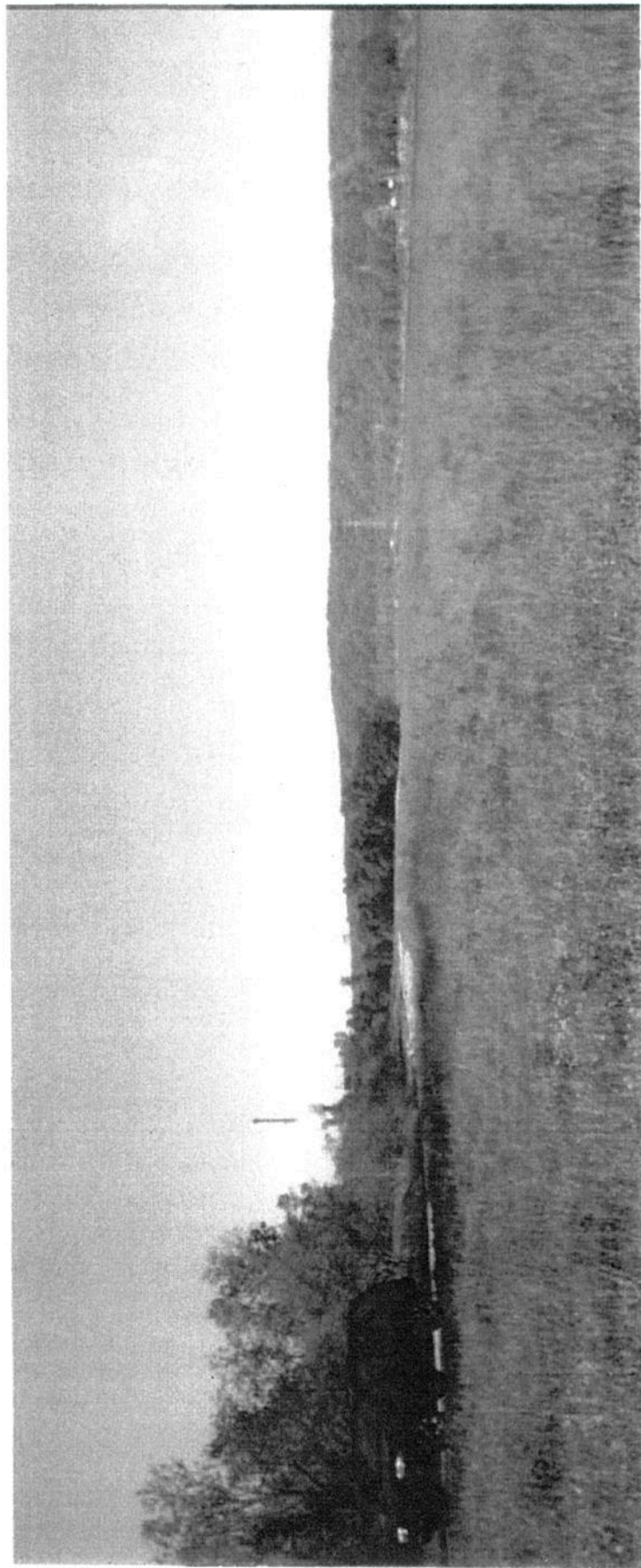


Photograph 4: View of gas collection system along central tract of landfill from former Putnam Street entrance to landfill. View to the north. Blower house in extreme right portion of picture. Note ATV track in foreground of picture. Gravel road is road along top of floodwall.



Photograph 5: Western view of southern tract of landfill area. Orange protective barriers represent western end gas collection system. Louisville Gas and Electric plant is in extreme left of picture. Southern tract of landfill is heavily wooded as evidenced by picture

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Photograph 6: Southwestern view of landfill cap area at the northern end of the central tract. Entire cap area is covered by the short grasses seen in picture. The Ohio River is shown along the central portion of the picture.



Photograph 7: Southwestern view of riprap along bank stabilization area of landfill. This area is located along northern end of central tract of property. Debris, as a result of flooding, is scattered throughout riprap.



Photograph 8: Southwestern view of riprap, central portion of bank stabilization area. Note channeling that has formed within riprap as a result of recent flooding of Ohio River.



Photograph 9: Similar to photograph 8. The wall formed by channeling is approximately 2.5 feet high at the greatest height.



Photograph 10. Southwestern view of access road within the middle of the central tract of landfill. Sandbags in foreground were apparently used to fill a large depression that had formed in the roadway.



Photograph 11. Another view of sandbag filled depression in access road.



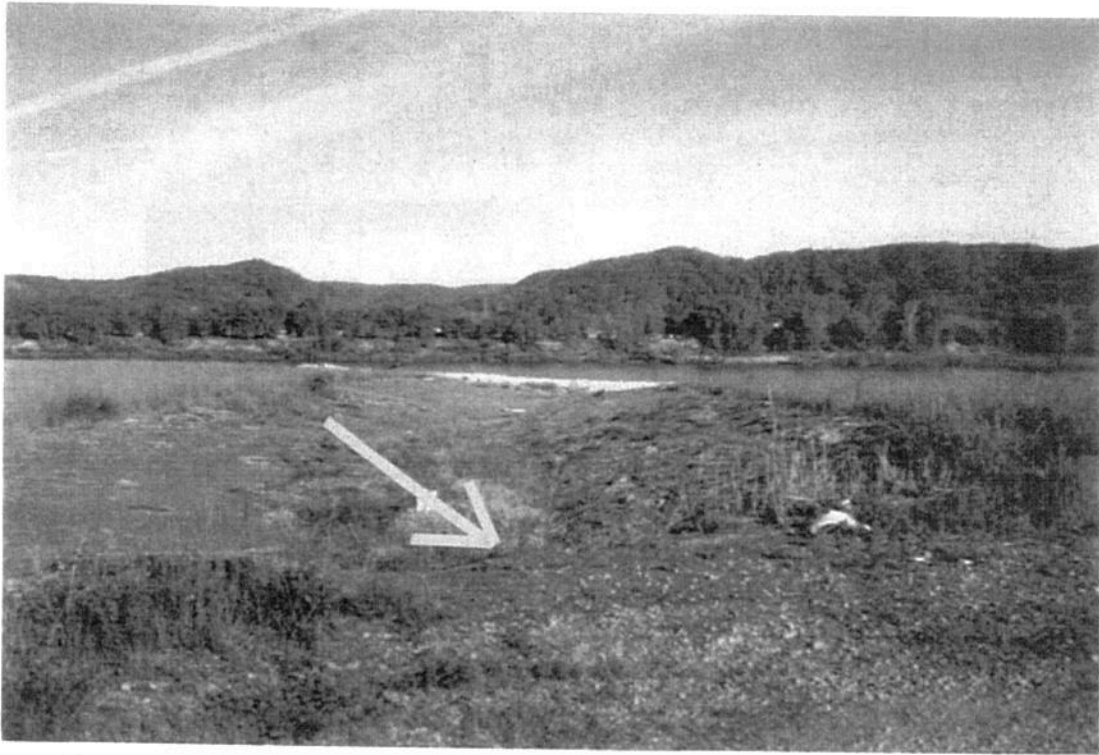
Photograph 12. Eastern view of depression in access road near former scalehouse location. This depression is located at head of riprap filled drainage channel located along eastern end of landfill cap area. The depression is approximately 10 feet long and 8 feet wide.



Photograph 13: Slight depression in access road. This depression is located within center of road in the central tract area. Depression is approximately 4 feet wide and 6 feet long.



Photograph 14: This large depression has formed at the southern end of the drainage channel that crosses the landfill along the western end of the cap area. This depression has resulted in buckling of the pavement.



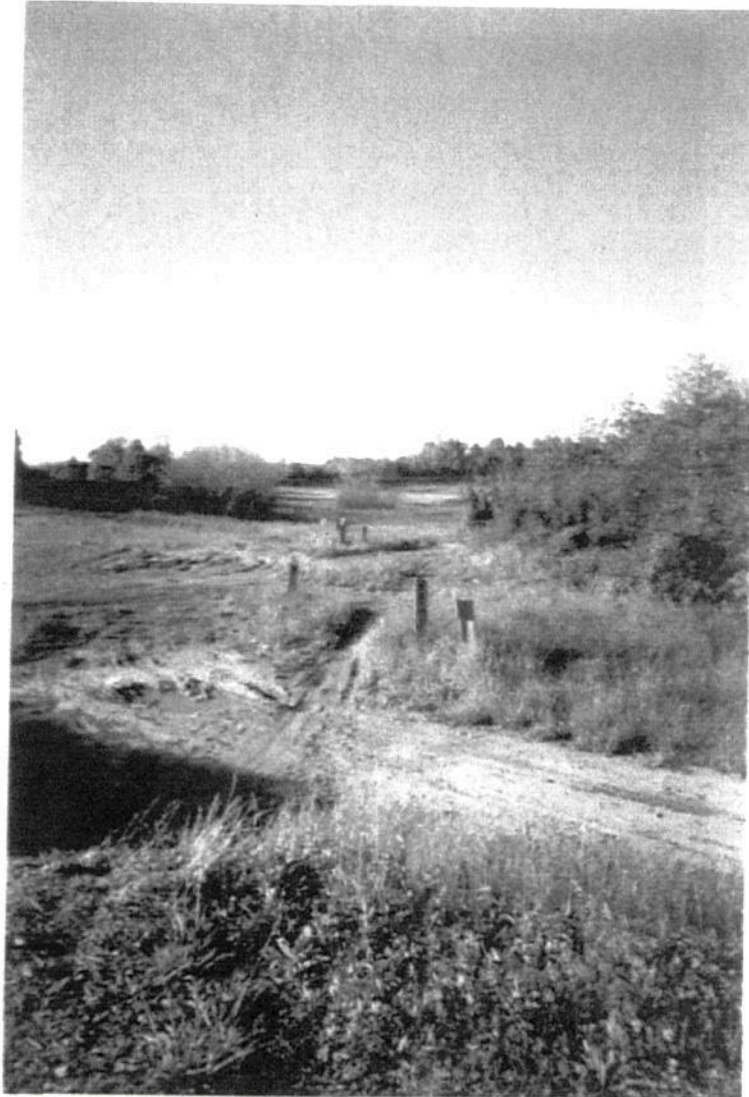
Photograph 15: View of drainage channel crossing landfill at western end of capped area. Arrow points to northern outlet pipe that crosses under access road. Southern end of pipe could not be located.



Photograph 16: Southwestern view of large depression along access road at western end of capped area. Yellow line demarcates edge of depression. Note standing water and automobile tracks leading into standing water. For scale, road is approximately 12 to 14 feet wide.



Photograph 17: Northern view of riprap lined drainage channel. The channel is located along the eastern perimeter of the capped area. The cap area is to the left in this picture. Note the significant amount of brush growth within the riprap. Also, brush growth becomes more significant towards the river.



Photograph 18: Southwestern view of the western end of the gas collection system. Orange colored posts are barriers around the gas sampling points. Note the ATV tracks around the two barriers in the foreground.



Photograph 19. Northeastern view of central portion of gas collection system. Orange colored posts are barriers adjacent to gas sampling points. Note the ATV tracks and areas of standing water around the barriers from the location of the photographer to approximately 200 feet away. Blower house is barely visible in left center of photograph.



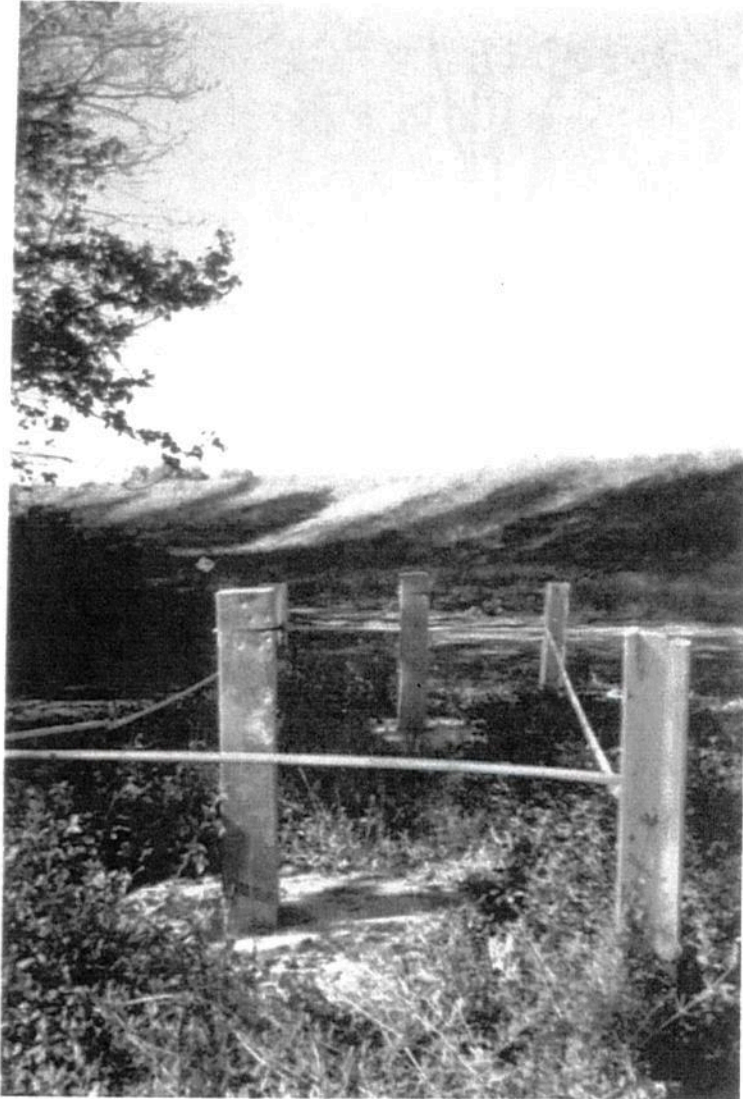
Photograph 20: Eastern end of gas collection system. Orange colored posts are barriers adjacent to gas sampling points. According to site documentation, this portion of the gas collection system is inoperable.



Photograph 21. Close-up view of gas sampling W5 at western end of gas collection system line. Note heavy growth of brush around location and ATV track in background. Gas sampling point lid could not be located in brush.



Photograph 22. Close-up view of lid of gas sampling point along gas collection system. Note the heavy growth of brush around unit. This same situation was encountered at all gas sampling points along gas collection system line.



Photograph 23: Gas wells G-1. Eastern view. Both protective casings locked. Both casings dented by bullets. Pads in good shape. This same situation was encountered at gas wells G-2, G-3, G-4, and G-5.



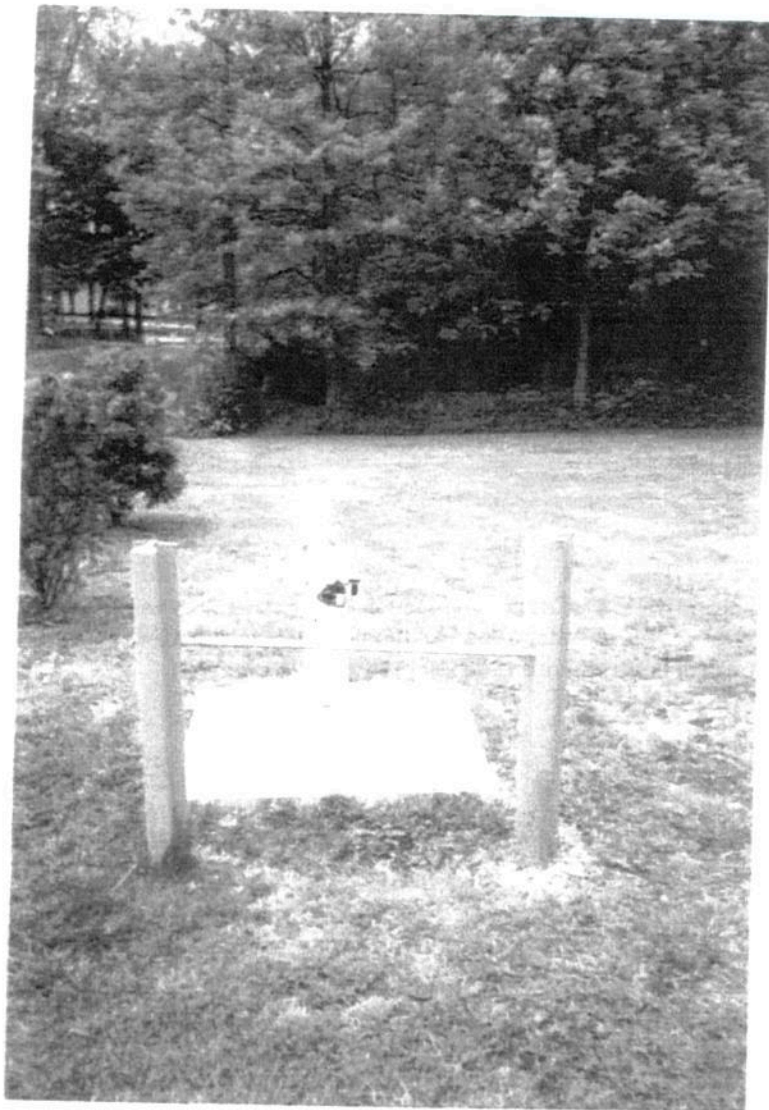
Photograph 24: Groundwater sampling at monitor well MW-A. Sampling was part of the quarterly monitoring program. Well protective casing and pad were in good condition and the well was locked during the time of the site review.



Photograph 25: Additional picture of sampling at monitor well MW-A.



Photograph 26: Northeastern view of groundwater monitor well MW-02. Well casing and concrete pad were in good condition and the well was locked at time of review.



Photograph 27: Northeastern view of groundwater monitor well MW-B. Well casing and concrete pad were in good condition and well was locked at time of review.



Photograph 28: Southeastern view of gas sampling wells G-5. Both wells were locked and concrete pads and protective casings were in good condition at time of review. Gate to enclosure was unlocked. Note growth of brush within and on top of enclosure.



Photograph 29: Southern view of an approximately 20,000-gallon tank near the former scalehouse and scales location. Numerous bullet holes were found in the entire tank. Visual observation of fluid was made of tank contents. Fluid within had a strong petroleum odor. Note moisture on bottom of tank in left-hand side of picture. Right-hand side (or western end) of tank was resting in water approximately two feet deep.



Photograph 30: Northern view of dead plant life zone that appears to originate from tank in photograph 29. The zone varied in width from approximately 8 feet to 35 feet. The overall length of this "dead zone" was approximately 150 feet.



Photograph 31: Southeastern view of dead plant life zone leading back towards the tank in background of the picture. From photographer's view, the "dead zone" moved to the right (or west) and into a small drainage swale.